TECHNOLOGY @ ROCKY FLATS

Demonstration & Deployment Summary

Polyurethane foam developed to block and brace waste container contents

Summary
One of the major challenges involved in closing Rocky Flats is the disposal of facility equipment contaminated with low level radioactive or hazardous waste. NUREG-1608 requires pre-shipment processing of LSA and SCOs prior to shipment. One of these requirements requires Blocking and Bracing of equipment to prevent damage to the Waste Package. Past practice has been to pack waste material in a standard waste container or cargo as best as possible and then have carpenters using wood timbers to block and brace the load at specified depths. This practice requires workers to reenter the waste container which is extremely labor-intensive, and exposes workers to significant industrial, chemical and radiological hazards. Cost and schedule are also significantly impacted.

Spraying structural foam into waste containers such as cargo containers allowed the waste to be transported safely to NTS with no load shifting, tipping or sliding resulting in no damage to the transport container.

A proposal in late 2001 to block and brace waste shipments with a spray polyurethane foam proved to be effective in meeting the requirements of the Waste Acceptance Criteria and NUREG-1608. Foam used for load stability provided a minimal addition of weight to the waste package and added structural strength to the standard waste container. This allowed the waste to be transported safely to NTS with no load shifting, tipping or sliding resulting in no damage to the transport container. Several large, pieces of waste including drive motors and heavy press bases have been blocked and braced effectively with polyurethane foam. The continued use of polyurethane spray foam to provide blocking and bracing to standard waste containers is expected to significantly reduce workers exposure to hazards, and reduce cost and schedule.

The Need

The difficulties associated with load shifting during transportation of LLW packaged in standard waste containers with the potential for breaching the container presents enormous challenges with respect to safety,

cost and scheduling. The packaging of both small and large pieces of production equipment from plutonium and beryllium processing facilities at Rocky Flats can take up to several weeks to complete at significant cost and safety risk. Hand placement of each and every object in a container, stacking objects to best use available space and blocking and bracing several times in each container presents an unacceptable exposure risks to employees. In addition, each container is loaded and stacked differently with no standard method for uniform blocking and bracing for load stabilization. Each separate container requires a unique engineering adaptation that increases worker exposure, cost, planning and schedule.

The Demonstration

Technical leads for Rocky Flats Buildings 883, 771 and 776 investigated the potential use of sprayable polyurethane foam as a block and brace media.

The physical properties of a closed cell, self-expanding polyurethane foam is ideal as a stabilizing material. A two-pound per cubic foot foam has an expansion factor of approximate 30X initial volume, compression strength of 24 psi, tack-free cure time of 160 seconds and can be applied from a position out side of the standard waste container. The low-density foam product flows into low points to fill voids between objects. The weight of the expanded foam contributes minimal to the waste package, three dimensional strength is added to the total package, foam curing to maximum strength is very rapid and exposure to workers is all but eliminated. Work stoppage from loading to allow blocking and bracing several times for each waste container is eliminated since the entire, loaded waste container is foamed by a small work crew taking only minutes per container.

A standard cargo container, 8' X 8' X 20', was loaded with LLW removed from Building 883. An inventory of all objects loaded was recorded and digital photos of the filled container were taken to be included with the waste stream package. Building 883 crew trained by the foam manufactures applied foam from outside the open doors of the container while I&H monitored the operation. Total time required to block and brace the container with foam was 21 minutes. After a technical review of this method of blocking and bracing, the Department of Transportation and the Nevada Test Site approved the use of closed cell structural polyurethane foam for low-level shipment to NTS.

A Rocky Flats worker demonstrates the use of structural foam to block and brace the contents of a cargo container.

Other Uses

In addition to foaming of cargo containers, foam has been used in HVAC ducts in building 886 to control the spread of contamination. Foam has also been used in underground ducts to fix contamination during size reduction and removal of the ducts.